

Hi this is Steve Nerlich from Cheap Astronomy www.cheapastro.com and this is *Talking to the Aliens*.

Remember those happy days when the 1977 release of *Close Encounters of the Third Kind* was followed by the alien kidnappings of over one million Americans – all of whom who were returned to Earth without a trace of evidence that anything, even those uncomfortable experiments, had actually happened?

All that Hollywood *do-do do-do do* stuff actually borrowed something from real life. Frank Drake, best known for his development of the Drake equation to calculate the number of alien civilisations in the universe, spent much of the early seventies developing a message from Earth that might be understood by one of those alien civilizations.

On the 16th of November 1974, the giant 300 metre diameter Arecibo radio telescope was used to transmit a 3 minute series of binary pulses, in fact 1,679 of them, being the product of the prime numbers 73 and 23. In a simple pictorial form the message starts by defining the decimal number system, followed by a depiction of the atomic numbers of hydrogen, carbon, nitrogen, oxygen, and phosphorus, followed by a depiction of the DNA helix that is built from those elements.

Then the message outlines the shape of a human figure, linked to a count of the Earth's population in 1974 (4.3 billion), then a rough depiction of the solar system and Earth within it and finally the dimensions of the transmitting Arecibo dish itself. The message was directed at Messier 13 – and if you don't know where that it is, ask an astronomer.

The message will get to Messier 13 in about 25,000 years and by then the transmission beam will have spread widely enough to be detected from most of the 300,000 stars in this globular cluster. The chance of success of this endeavour has a rough equivalence to Drake's famous equation. From within all the stars in the transmission beam, there has to be at least one ecosystem, which has developed at least one intelligent species, which has developed a sufficiently advanced technology to receive our signal at just the right time that the signal gets to them.

That's the problem with sending messages at the speed of light. If there's something good on TV that night, the aliens could miss the whole thing. Wouldn't it be great if we could just toss a message in a bottle into the vast cosmic ocean, so they could pick it up at their leisure.

Or why not two bottles? Pioneer 10 and 11 launched in 1972 and 1973 respectively explored Jupiter and Saturn respectively and then just kept going. Both carry a special plaque, with a picture of a naked man and woman and then a brilliant schematic diagram which allows any alien species to determine the location of Earth based on the distribution of pulsars within the Milky Way Galaxy. Pulsars are incredibly interesting objects made of degenerate matter that...

But of course hardly anyone gets past the naked people. The press were quick to respond with reports of '*NASA spends millions sending smut to the stars*'. Feminists were understandably annoyed that the woman just kind of stood there while the man is in the foreground with a raised hand as though saying *Hi Aliens! I represent the human race - and she does the cooking*.

Anyway, the pulsar map really was clever - being designed by Frank Drake on a suggestion from Carl Sagan and it's Carl Sagan that takes the lead for a new set of even more ambitious messages in bottles.

Voyager 1 and 2 were launched in 1977, both visited Jupiter and Saturn and Voyager 2 went on to fly by Uranus and Neptune, while Voyager 1 did a special fly-by of Saturn's moon Titan. Both spacecraft then just kept going. Both are approaching the very edges of interstellar space, with Voyager 1 at 16 billion km from the Sun being the furthest man-made object from earth. Both spacecraft carry an identical golden phonograph record. It's contained within an aluminium case engraved with instructions for how to play it, Drake's clever pulsar map and no nudie pictures. The record even has a label titled '*The Sounds of Earth*' and a cartridge and needle to play it with are included in the case.

Carl Sagan chaired the committee that developed the contents of the record. Based on the transition of a hydrogen atom, the aliens are instructed at what speed to play the record, which is about 16 rpm (for those who remember what rpm means). The record contains about ninety minutes worth of music, some brief verbal messages from speakers of different languages around the world and a bit of whale song. The record also has a section where the waveforms of the sound are used to build high resolution colour photos, using a technology similar to that used to transmit free-to-air television.

Getting the record into space was no easy task – and I don't mean the launch systems. A photo of a naked couple, this time with the woman pregnant to emphasise that the purpose of all this was to depict human biology, was immediately rejected by NASA. Sagan's committee compromised with a blacked out silhouette, including a depiction of a foetus within the woman's womb. However... hidden away on slide 52 is a rough diagram of the evolution of life on Earth, showing a progression from fish to amphibian to reptile to mammal – and representing the humans is new picture of the naked Pioneer couple, but this time they are side by side and it's the woman who is raising her hand in greeting – perhaps with an *I'm with Stupid* look on her face.

While much of the golden record's content is more an attempt to capture the symbolic essence of humanity and its home, it still manages to communicate what kind of life form we are and something of the mathematical/scientific framework in which we exercise our intelligence.

I'm not sure the same can be said for NASA's 50th birthday bash in 2008 when the entire technological sophistication of the Deep Space Network was diverted to transmit a baby boomer anthem (*Across the Universe* by the Beatles) at the northern star Polaris.

No offence to the Beatles but to paraphrase Carl Sagan: *Not all bits of information carry equal value*. Next time there's an opportunity to send a 3 minute broadcast out to the universe, how about we talk to Frank Drake first.

Thanks for listening. This is Steve Nerlich from Cheap Astronomy, www.cheapastro.com. Cheap Astronomy offers an educational website for all those times when he who steals your purse steals trash. Bye.